FY 2012 STATE WILDLIFE GRANT (SWG)
SWG Implementation Grant

State of Illinois

Grant Narrative

PROJECT TITLE: Vermilion River basin biological assessment for dam removal

PROJECT NUMBER: T-86 -R-1

NEED:

Impoundments are one of the major sources of anthropogenic disturbances on streams. Dam effects include converting lotic habitats to lentic habitats, changing flow regimes, altering physicochemical parameters, increasing siltation upstream and scouring substrates downstream from the dam, and altering fish assemblages and/or blocking movement of fishes. The resultant dam effects can alter aquatic assemblages (e.g., fishes, freshwater mussels, and aquatic insects), including reduced native species richness and abundance, as well as restricted distributions and isolated populations.

The 11-foot high Danville Dam, constructed in 1914, serves as the downstream-most impoundment between the Wabash River and the Vermilion River basin. The dam is an effective barrier between the lower 22 miles of the Vermilion River mainstem and the 1,290 mi^2 drainage area upstream, hindering distribution of several aquatic organisms, including 96 species of fish and 46 species of mussels. The dam is also a safety hazard with three drownings in the past ten years.

Ellsworth Park Dam is a low-head dam constructed in 1920, near the confluence of the North Fork Vermilion River with the Vermilion River. This outdated dam serves as a barrier to approximately four river miles of excellent habitat downstream of Lake Vermilion. This dam is the site of one drowning in recent years.

Danville Dam on the Vermilion River and Ellsworth Park Dam on the North Fork Vermilion River are slated for removal in 2014. This dam removal project will remove a barrier to 1,115 stream miles upstream of these dams in the Vermilion River basin, benefitting an extraordinarily high number of Species in Greatest Need of Conservation (83) of the Illinois Wildlife Action Plan **(IWAP pages 294-309)** (33 mollusks, 28 fish, 15 amphibians, 5 reptiles, and 2 crustaceans,). Dam removal also has been identified as a priority in the Vermilion River Conservation Opportunity Area Plan **(IWAP page 271)** (Goal 2, Objective 4, Strategy 1). The project also addresses 4 of the Ohio River Basin Fish Habitat Partnership Strategic Actions: protecting healthy waters, restoring natural variability in river and stream flows, reconnecting fragmented stream habitat, and reducing altered temperature and oxygen levels.

Benefitting species include 2 federally listed mussel species (Northern riffleshell and clubshell), 26 state listed species, and many game species, including smallmouth bass. The project will also

open downstream access to the Middle Fork Vermilion River, Illinois' only National Scenic River.

The benefits of removing these barriers within the Vermilion River basin are potentially monumental in scope. Progress toward these goals deserves to be monitored and documented in order to affirm success and advise adaptive management and additional needs.

PURPOSE:

State Wildlife Grant funding is being requested to assess baseline biotic and abiotic conditions in the Vermilion River and North Fork Vermilion River to determine current conditions upstream and downstream of Danville Dam on the Vermilion River and Ellsworth Park Dam on the North Fork Vermilion River. Results from these monitoring efforts will help guide plans for the dam removal and potential channel modifications, and will allow us to monitor and evaluate changes in the biological communities and various abiotic metrics following dam removal. Few dam removal studies that fully address biologic responses among multiple organism groups (fish, mussels, and macroinvertebrates) have been published. This study will contribute significantly to the growing body of literature.

OBJECTIVES:

1. Conduct fish population surveys at 12 stations, twice per year in spring and fall of 2013 and 2014 and once in spring of 2015 (5 replicates).

2. Conduct mussel surveys at 12 stations, once in summer of 2013 and once in summer of 2015 (2 replicates).

3. Conduct macroinvertebrate surveys at 12 stations, twice per year in spring and fall of 2013 and 2014 and once in spring of 2015 (5 replicates).

4. Conduct habitat quality assessments at 12 stations, twice per year in spring and fall of 2013 and 2014 and once in spring of 2015 (5 replicates).

5. Collect seasonal water quality samples at 6 stations, at least four times per year in 2013 and 2014 and once in 2015, at three sites per dam, testing for suspended solids, hardness, alkalinity, chlorophyll, phosphates and nitrates.

6. Conduct sediment transport monitoring concurrent- and post-dam removal by adding continuous monitoring capabilities to the existing USGS stream gauge during and after dam removal construction work.

EXPECTED BENEFITS AND RESULTS:

This dam removal project will remove a barrier to 1,115 stream miles (190 mi^2 of watershed)

upstream of Danville Dam in the Vermilion River basin, benefitting an extraordinarily high number of Species in Greatest Need of Conservation (83) of the Illinois Wildlife Action Plan **(IWAP pages 294-309)** (33 mollusks, 2 crustaceans, 28 fish, 15 amphibians, 5 reptiles). With the Vermilion River basin being one of the most biologically significant basins in the state, identified as a Conservation Opportunity Area **(IWAP page 271)** for the state of Illinois, biological monitoring of this critical act of dam removal is imperative.

Intensive collection of biotic and abiotic baseline conditions will allow us to determine current influences of these dams. We will further use these data to guide the decision-making process for the dam removals and potential channel modifications and habitat improvements following dam removal. Collection of these data will also allow us to compare and track changes that develop, following the dam removals. This will allow us to gauge the results of the project and advise any necessary adaptive management actions. Finally, comprehensive data from this project will be used to manage future proposed dam removal projects.

APPROACH:

To assess the impacts of removing the Ellsworth and Danville dams on the aquatic biota and stream habitat quality, a three phase project on this system is initiated. Beginning October 2012, Eastern Illinois University began an assessment of the fish and macroinvertebrate assemblages in twelve, 100 meter long sections of the rivers. Six of the 12 sites surveyed were located in the North Fork Vermilion River, referred to as Ellsworth Dam sites and six sites in the Vermilion River, referred to as Danville Dam sites. Each dam assessment consists of two sites below the dam and four sites above the dam. The above dam sites consist of locations directly above the dam, the last 100 meters of the pool, the first 100 meters of the river and an upstream site (a further upstream location). This sampling captures the community composition both above and below the dam (immediate impacts) and characteristics of sites above the dam's influence.

Job 1. Conduct fish population surveys at 12 stations (5 replicates).

Eastern Illinois University researchers will utilize a multiple gear approach for fish sampling, needed to maintain consistency before and after dam removals. Ellsworth Dam fish shocking will be using DC barge shocking with a 2,500 watt generator. Fish shocking will use a five person crew, three probe/netters and two extra netters. Each site will be electrofished for a total of 30 minutes beginning downstream and moving upstream. Danville Dam sites will be sampled using DC boat shocking with a 4,000 watt generator with two spider array droppers for a total of 30 minutes across the entire area. This reflects the larger nature of this channel. Two seine hauls will be conducted for all Danville Dam sites at the nearest sandbar. The seine samples are needed to ensure collection of smaller fish the DC boat shocking is not likely to capture. All fish over 100 mm will be measured to the nearest millimeter in total length and weighed to the nearest gram. Cyprinids and fish fewer than 100 mm will be euthanized and preserved in 10% formalin solution for identification in the laboratory.

Surveys of the 12 sites described above will be conducted in the spring and fall by Eastern Illinois University researchers, with target dates in May and September depending on flow conditions. The

sites will be sampled twice per year in 2013 and 2014, and culminate with a spring sample in 2015. The exact dates of the dam removal are not yet known, so the number of pre- and post-dam removal samples is undetermined at this time.

Species richness and diversity will be calculated for fish for each site using methods from Lande 1996. An index of biotic integrity for fish at each site pre- and post-removal will be calculated using methods from Angermeier and Karr 1986. A multiple analysis of variance (MANOVA) will be conducted to test the significance of abiotic factors (see Job 4) and community structure. An ANOVA will be used to test for significance of habitat quality (see Job 4) of individual sites pre- and post-removal of the dams.

Job 2. Conduct mussel surveys at 12 stations (2 replicates).

Live freshwater mussels and valves of dead specimens will be collected by hand grubbing for four person-hours at each of the 12 sites described above by an Illinois Natural History Survey (INHS) mussel crew. Mussels will be identified, measured (shell length), aged, and if possible, live individuals will be sexed before returning them to the site. Voucher specimens (dead shell) of all species will be taken at each site to be deposited in the INHS Mollusk Collection. An effort to sample all available habitats will be made, but particular emphasis will be placed on areas that appear likely to support freshwater mussels (e.g., gravel riffles, runs, and pools). The INHS Mollusk Collection will be consulted to determine historical records (eg., presence/absence). Regarding nomenclature, the list of common and scientific names of mollusks prepared by the Council of Systematic Malacologists and the Committee on Scientific and Common Names of the American Malacological Union will be followed, except subspecies will not be recognized. Freshwater mussel abundance and richness (number of species) will be calculated. Analysis of variance (ANOVA) will be conducted to test the significance of community structure.

Mussel surveys will be conducted pre-dam removal during the summer of 2013 (July to August) and post-dam removal during the summer of 2015 (July to August). This information will be used to assess the baseline condition of the freshwater mussel population pre-dam removal and immediate response of the mussel populations post-dam removal. These collection data will be further used to compare to periodic post-dam removal collections for years to come, as mussel populations are likely to take several years to colonize the previously impounded reaches.

Job 3. Conduct macroinvertebrate surveys at 12 stations (5 replicates).

Macroinvertebrate surveys will be conducted at the 12 stations described above by Eastern Illinois University researchers. The macroinvertebrate sampling for the four upper Danville Dam sites, which are non-wadeable, will include a random set of 20 jabs. In order to ensure consistency, seven random jabs (D-frame net, based on habitat percentages from QHEI assessments) will be conducted on each bank side and six ponar grabs in the main channel.

Macroinvertebrate communities will be assessed at all wadeable sites using a multi-habitat set of 20 jabs, based on habitat percentages from QHEI assessments. All macroinvertebrate samples will be preserved in 95% ethanol for identification in the laboratory. A subset of 300 macroinvertebrates will be sampled using sample splitter and identified to the lowest taxonomic

group possible. Macroinvertebrate surveys will be conducted at the same frequency and timeframe as the fish surveys.

Job 4. Conduct habitat quality assessments at 12 stations (5 replicates).

Habitat quality assessments will be conducted by Eastern Illinois University researchers. Habitat for the non-wadeable upper Danville Dam sites will be assessed through the stream habitat assessment protocol (non-wadeable sites, n =4). Habitat quality will be assessed at all wadeable sites using the Ohio Qualitative Habitat Evaluation Index (wadeable sites, n =8). Following removal of the dams, sampling for all sites will likely be done using QHEI protocol as wadeable sites. Habitat data will be used to identify physical changes following dam removal, and as abiotic factors in the analyses of the biotic data. Habitat surveys will be conducted at the same frequency and timeframe as the fish surveys.

Job 5. Collect seasonal water quality samples at 6 stations, testing for suspended solids, hardness, alkalinity, chlorophyll, phosphates and nitrates.

Water samples will be collected seasonally by Eastern Illinois University researchers, at least four times per year, at three sites per dam. Water will be collected below the dam, in the pool above the dam and in the first 100 meters of the river above the pool. A YSI multi meter will be used to determine PH, temperature, conductivity and dissolved oxygen on site. Samples brought back to Eastern Illinois University will be analyzed for suspended solids, hardness, alkalinity, chlorophyll, phosphates and nitrates using standard methods. Samples will be used to identify changes in water quality following dam removal, and as abiotic factors in the biotic analyses.

Job 6. Conduct sediment transport and hydraulic modeling concurrent- and post-dam removal.

United States Geological Survey staff will be contracted to conduct sediment transport and hydraulic modeling. Sediment transport monitoring will be added to the existing USGS stream gage 03339000 to determine both suspended and bedload sediment transport. Measurements and lab methods will follow Field Methods for Measurement of Fluvial Sediment (Edwards and Glyson, 1999) and Analysis of Fluvial Sediment by the Northeastern Region, Kentucky Science Center Sediment Lab (Sholar and Shreve, 1998). Suspended sediment daily loads will be computed by the subdivided-day method (time-discharge weighted average) (Guy, 1970 and Porterfield, 1972).

Results will be compared to pre-dam removal monitoring results presented in the report, “Sediment and Hydraulic Modeling of Danville Dam on the Vermilion River and Ellsworth Park Dam on the North Fork Vermilion River at Danville, Illinois” by Timothy D. Straub (U.S. Department of the Interior, U.S. Geological Survey).

COMPLIANCE:

The IDNR will use its CERP (Comprehensive Environmental Review Process) as a tool to aid the Department in meeting NEPA compliance for the projects outlined under this grant proposal. It is

the Department=s policy to require CERP applications for all land disturbing activities unless those activities are covered by CERP exemptions (see the enclosed CERP documents).

All planned activities will also be in compliance with the Endangered Species Act. All determinations and documentation will be in accordance with the current established U.S. Fish and Wildlife Service protocols for Section 7.

All planned activities will be in compliance with the National Historic Preservation Act and the Council on Historic Preservation Act. All determinations and documentation will be in accordance with the terms of the Programmatic Agreement, as amended, effective September 23, 2002.

Planned activities which involve a floodplain and/or jurisdiction of wetlands will be done in accordance with Presidential Executive Orders 11988 and 11990.

GEOGRAPHIC LOCATION:

The Vermilion River basin (Wabash River drainage) is located in east central Illinois (parts of Livingston, Ford, Iroquois, Champaign, and Vermilion counties) and western Indiana (parts of Warren and Vermillion counties). It drains 1,434 mi^2, and its basin includes the Salt Fork sub-basin (506 mi^2), the Middle Fork sub-basin (438 mi^2) and the North Fork sub-basin (294 mi^2). It flows through two natural divisions: Wabash Border and Grand Prairie.

The Danville Dam [Latitude: 40.12225N & Longitude: 87.63156W] is located about 22 miles upstream from the confluence with the Wabash River, and is located downstream of the Highway 150/1 bridge in Danville, Vermilion County, Illinois. The dam is located in Congressional District 15. The 8-digit HUC number is 05120109.

The Ellsworth Park Dam is less than one mile upstream on the North Fork Vermilion River, southwest of the aforementioned highway intersection [Latitude: 40.12547N & Longitude: 87.63922W].

Figure 1 – Location of the Danville Dam and Ellsworth Park Dam. The dams are located in Danville, Vermilion County, Illinois.

Figure 2 – Location of the Danville Dam and Ellsworth Park Dam within the Vermilion River basin (Wabash River drainage).

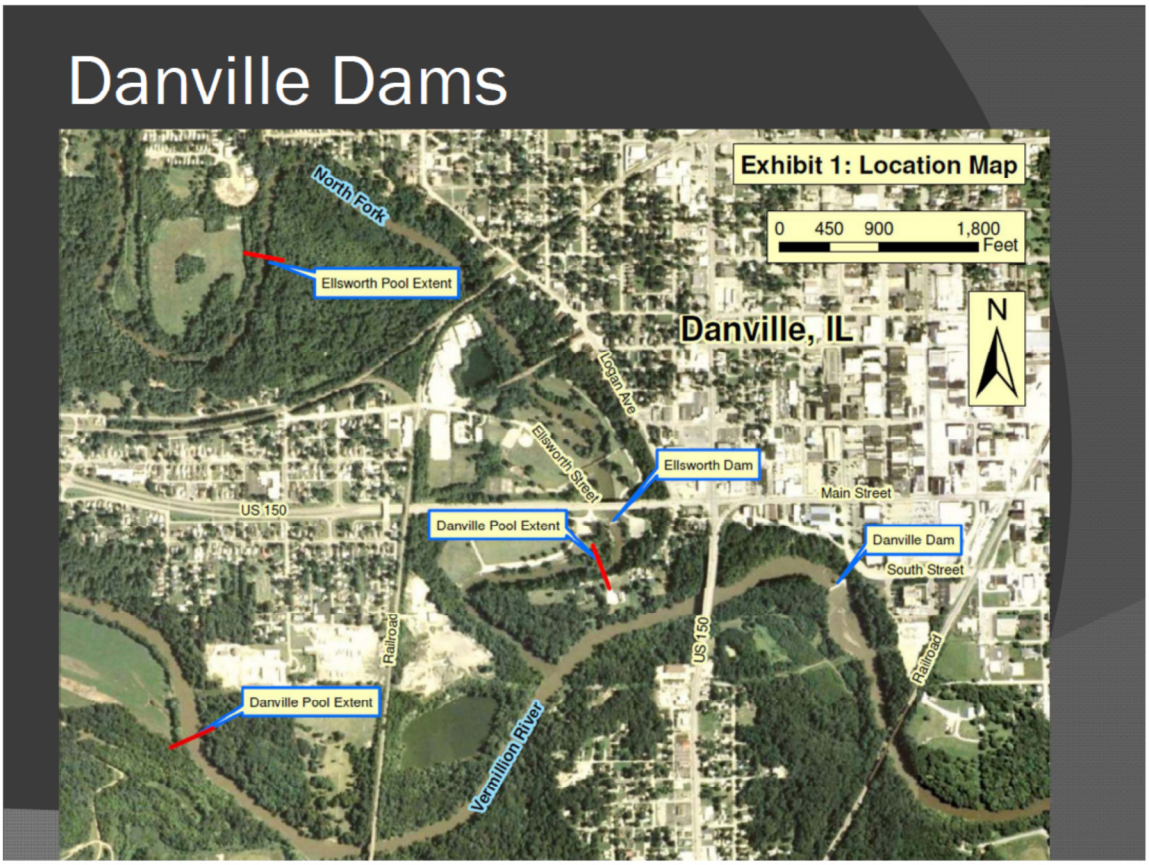

Figure 3 – Plan overview of the Danville Dam and Ellsworth Park Dam, illustrating the approximate pool impacts of each dam.

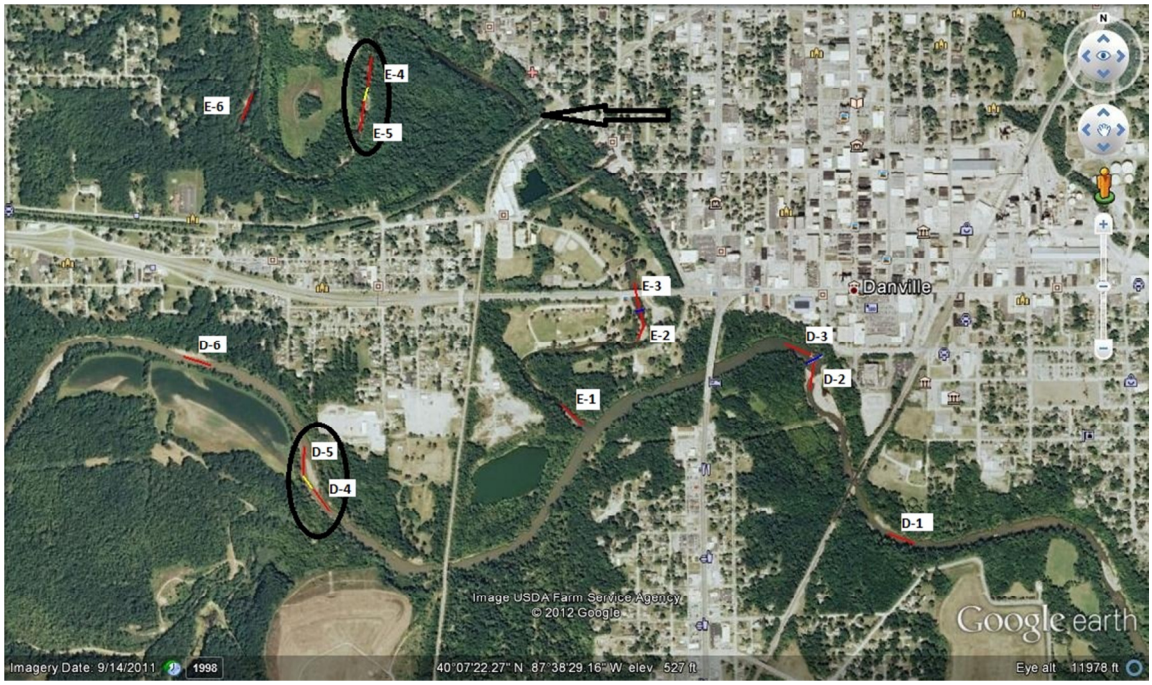

Figure 4 – Map showing the locations of the 12 sampling stations.

PRINCIPAL INVESTIGATORS:

Trent Thomas, IDNR, Division of Fisheries, will serve as Project Manager for the biomonitoring component of the grant.

Trent Thomas
Illinois Department of Natural Resources
301 South Date Street
Gibson City, IL 60936
(217) 784-4730 ext. 230

Drs. Robert Colombo and Scott Meiners, Eastern Illinois University – Department of Biological Sciences, will be contracted to conduct the surveys of fish, macroinvertebrates, habitat, and water quality.

Robert E. Colombo
Assistant Professor of Fisheries Biology
Department of Biological Sciences
Eastern Illinois University
Charleston, IL 61920
(217) 581-3011

Scott Meiners
Professor of Ecology
Department of Biological Sciences
Eastern Illinois University
Charleston, IL 61920
(217) 581-3425

Jeremy Tiemann, Illinois Natural History Survey, will be contracted to conduct the mussel surveys.

Jeremy Tiemann
Illinois Natural History Survey
Prairie Research Institute at the University of Illinois at Urbana-Champaign
1816 South Oak Street
Champaign, IL 61820
(217) 265-4678

Wes Cattoor, IDNR, Office of Water Resources, will serve as Project Manager for the dam removal/channel modification work.

Wes Cattoor, P.E., CFM
Project Engineer
Illinois Department of Natural Resources, Office of Water Resources
One Natural Resources Way
Springfield, IL 62702-1271
(217) 782-4847

The United States Geological Survey (USGS) will be contracted to monitor sediment transport.

Tim Straub
U.S. Geological Survey
1201 West University Avenue
Urbana, IL 61801
(217) 328-9735

Doug Ahrens, Director of Public Works, and David Schnelle, City Engineer, will serve as the project contacts for the City of Danville.

Doug Ahrens
Public Works Director
Danville Public Works Department
1155 E. Voorhees, Suite A
Danville, IL 61832
(217) 431-2267

R. David Schnelle
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BUDGET NARRATIVE

The full amount of this State Wildlife Grant will be used for contractual work for biological assessment, pre- and post-, of the projects to remove Ellsworth Park Dam on the North Fork Vermilion River and the Danville Dam on the Vermilion River. The majority of the funding ($30,000) will go towards a contract with Eastern Illinois University to conduct surveys of the fish population, macroinvertebrate population, habitat parameters, and water quality. The Illinois Natural History Survey will be contracted to conduct one round of pre-dam removal mussel population surveys and one round of post-dam removal mussel population surveys for $2,000. The remainder of the funding, $14,173, will go to the Office of Water Resources to contract work by the USGS to monitor sediment movement during dam removal activities and up to one year following dam removal.

IDNR match for the State Wildlife Grant funds will be paid from a Natural Resources Damage Assessment fund from the Office of Realty & Planning, Contaminant Assessment Section.

Expense Item	SWG Funds	IDNR Match	Total
EIU contracted monitoring	$19,500	$10,500	$30,000
INHS contracted mussel surveys	$1,300	$700	$2,000
OWR for contracted sediment monitoring	$9,200	$4,973	$14,173
Totals	$30,000	$16,173	$46,173

GRANT SEGMENT - BUDGET INFORMATION **IL DEPT. OF NATURAL RESOURCES**

BUDGET INFORMATION - NON-CONSTRUCTION PROGRAMS

PROJECT NO. : T- -R-1 **SEGMENT NO.** **1**

PROJECT NAME: Vermilion River basin biological assessment for dam removal (Totals)

EFFECTIVE DATES:	From:	5/1/2013	To:	12/31/2015	
BY OBJECT CATEGORIES	FED SUBACTIVITY NO.	FED SHARE	STATE SHARE	TOTAL	
SALARIES AND WAGES		$23,612	$12,733	$36,345	
INDIRECT		$1,903	$1,025	$2,928	
TRAVEL		$455	$245	$700	
EQUIPMENT (per A-102 definition)				$0	
SUPPLIES/COMMODITIES		$585	$315	$900	
CONTRACTUAL		$3,445	$1,855	$5,300	
TOTAL DIRECT COSTS		$30,000	$16,173	$46,173	
TOTALS		$30,000	$16,173	$46,173	

PROJECT NAME: Vermilion River basin biological assessment for dam removal (Eastern Illinois University Sub-contract)

EFFECTIVE DATES:	From:	5/1/2013	To:	12/31/2015	
BY OBJECT CATEGORIES		FED SUBACTIVITY NO.	FED SHARE	STATE SHARE	TOTAL
SALARIES AND WAGES			$17,727	$9,545	$27,272
INDIRECT			$1,773	$955	$2,728
TRAVEL					$0
EQUIPMENT (per A-102 definition)					$0
SUPPLIES/COMMODITIES					$0
CONTRACTUAL					$0
TOTAL DIRECT COSTS			$19,500	$10,500	$30,000
TOTALS			$19,500	$10,500	$30,000

Contractual funds for EIU will fund a graduate student at $13,636 per year for two years with 10% indirect costs.

PROJECT NAME: Vermilion River basin biological assessment for dam removal (Illinois Natural History Survey Sub-contract)

EFFECTIVE DATES:	From:	5/1/2013	To:	12/31/2015	
BY OBJECT CATEGORIES	FED SUBACTIVITY NO.	FED SHARE	STATE SHARE	TOTAL	
SALARIES AND WAGES		$1,170	$630	$1,800	
INDIRECT		$130	$70	$200	
TRAVEL				$0	
EQUIPMENT (per A-102 definition)				$0	
SUPPLIES/COMMODITIES				$0	
CONTRACTUAL				$0	
TOTAL DIRECT COSTS		$1,300	$700	$2,000	
TOTALS		$1,300	$700	$2,000	

Contractual funds for the INHS will be used to hire an hourly worker for $1,800 plus 10% indirect costs to conduct pre- and post-dam removal mussel surveys.

PROJECT NAME: Vermilion River basin biological assessment for dam removal (USGS Sub-contract)

EFFECTIVE DATES:	From:	5/1/2013	To:	12/31/2015	
BY OBJECT CATEGORIES	FED SUBACTIVITY NO.	FED SHARE	STATE SHARE	TOTAL	
SALARIES AND WAGES		$4,727	$2546	$7,273	
INDIRECT				$0	
TRAVEL		$455	$245	$700	
EQUIPMENT (per A-102 definition)				$0	
SUPPLIES/COMMODITIES		$585	$315	$900	
CONTRACTUAL		$3,433	$1,867	$5,300	
TOTAL DIRECT COSTS		$9,200	4,973	$14,173	
TOTALS		$9,200	$4,973	$14,173	

Contractual funds for the USGS will be used to fund personnel for sediment sampling and operation and maintenance of the equipment ($7,273). $700 will be used for travel, including up to 10 trips to and from the gauging site, up to 2 trips to meetings in Springfield, and quarterly trips to the Kentucky USGS lab for sample delivery and analysis. $900 will be used for sampler maintenance and miscellaneous lab and field supplies. $5,300 will be used for contracted laboratory analyses.

BUDGET JUSTIFICATION:

The intensive monitoring effort required to adequately assess this project necessitates contractual support from sources outside the Illinois Department of Natural Resources. The commitment of time and personnel and need for specialized equipment precludes the IDNR's ability to absorb this project into the current duties of its field staff.

The contract with Eastern Illinois University will be utilized to fund a graduate student for two years, with 10% indirect costs, to work on this monitoring project through the spring of 2015.

The contract with the Illinois Natural History Survey will be utilized to fund hourly help, with 10% indirect costs, to assist with the surveys of the mussel populations in 2013 and 2015.

The Office of Water Resource's contract with the USGS will be utilized to fund sediment monitoring during dam removal activities and following the completion of the work for up to one year. Travel, supplies, and contracted lab analysis costs are included in this contract.

TIMELINE:

2013 SCHEDULE

Objectives	Spring	Summer	Fall	Winter
Fish population surveys (Obj. 1)	**X**		**X**	
Mussel surveys (Obj. 2)		**X**		
Macroinvertebrate surveys (Obj. 3)	**X**		**X**	
Habitat assessments (Obj. 4)	**X**		**X**	
Water quality samples (Obj. 5)	**X**	**X**	**X**	**X**
Sediment transport monitoring (Obj. 6)*				

2014 SCHEDULE

Objectives	Spring	Summer	Fall	Winter
Fish population surveys (Obj. 1)	**X**		**X**	
Mussel surveys (Obj. 2)				
Macroinvertebrate surveys (Obj. 3)	**X**		**X**	
Habitat assessments (Obj. 4)	**X**		**X**	
Water quality samples (Obj. 5)	**X**	**X**	**X**	**X**
Sediment transport monitoring (Obj. 6)*			**X**	**X**

2015 SCHEDULE

Objectives	Spring	Summer	Fall	Winter
Fish population surveys (Obj. 1)	**X**			
Mussel surveys (Obj. 2)		**X**		
Macroinvertebrate surveys (Obj. 3)	**X**			
Habitat assessments (Obj. 4)	**X**			
Water quality samples (Obj. 5)	**X**			
Sediment transport monitoring (Obj. 6)*	**X**	**X**	**X**	

*Sediment transport monitoring (Obj. 6) timing is dependent on the actual dates of dam removal.